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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/754,570	01/04/2001	Evgeny Yakhnich	2681/01134	2874
25937	7590	01/12/2005	EXAMINER	
ZARETSKY & ASSOCIATES PC			ODOM, CURTIS B	
8753 W. RUNION DR.			ART UNIT	
PEORIA, AZ 85382-6412			PAPER NUMBER	
			2634	

DATE MAILED: 01/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/754,570	<b>Applicant(s)</b> YAKHNICH ET AL.	
	<b>Examiner</b> Curtis B. Odom	<b>Art Unit</b> 2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 September 2004.
- 2a) ☐ This action is **FINAL**.      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-74 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-24, 26-43 and 46-48 is/are allowed.
- 6) ☒ Claim(s) 49-65 and 67-73 is/are rejected.
- 7) ☒ Claim(s) 25, 44, 45, 66 and 74 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 25, 44, 45, 59, and 65 are objected to because of the following informalities:
  - a. Claim 25, which inherits the limitations of claim 18, is suggested to be cancelled because the limitations of dependent claim 25 are recited in independent claim 18.
  - b. Regarding claims 44, 45, and 65, in claims 44 and 65, the phrase “the most likely log likelihood value” is suggested to be changed to “a most likely log likelihood value”.
  - c. Regarding claim 59, the word “method” is suggested to be changed to “receiver”.Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 49-53 are rejected under 35 U.S.C. 102(e) as being anticipated by Divsalar et al. (U. S. Patent No. 6, 023, 783).

Regarding claim 49, Divasalar et al. discloses a method of generating soft bit outputs from soft symbol values, the method comprising:

receiving for each symbol (column 17, lines 1-46, Equation 16) a plurality of soft symbol values represented as symbol log likelihood ratios;

determining (column 17, lines 1-46, Equation 17, numerator), for each bit in the symbol, a first likelihood representing the probability that the bit is a one, the first likelihood determined based on the symbol log likelihood ratios;

determining (column 17, lines 1-46, Equation 17, denominator), for each bit in the symbol, a second likelihood representing the probability that the bit is a zero, the second likelihood determined based on the symbol log likelihood ratios;

computing (column 17, lines 1-46, Equation 17) a soft bit value for the bit as a function of the first likelihood and the second likelihood.

Regarding claims 50, which inherits the limitations of claim 49, Divsalar et al. discloses the first likelihood is determined by summing the soft symbol values for all symbols wherein the bit is a one (column 17, Equation 17, numerator).

Regarding claim 51, which inherits the limitations of claim 49, Divsalar et al. discloses the second likelihood is determined by summing the soft symbol values for all symbols wherein the bit is a zero (column 17, Equation 17, denominator).

Regarding claim 52, which inherits the limitations of claim 49, Divsalar et al. discloses the first likelihood comprises the maximum soft symbol value from among all symbol values wherein the bit is a one (column 20, lines 5-17).

Regarding claim 53, which inherits the limitations of claim 49, Divsalar et al. discloses the second likelihood comprises the maximum soft symbol value from among all symbol values wherein the bit is a zero (column 20, lines 5-17).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 54-65 and 67-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Divsalar et al. (U. S. Patent No. 6, 023, 783).

Regarding claim 54, Divsalar et al. discloses first decoder (Fig. 17, column 17, lines 1-46) operative to receive a signal and to generate a sequence of soft symbol decisions therefrom;  
a soft symbol decision to soft bit output converter (Fig. 17, column 17, lines 1-46)  
comprising processing means programmed to:

receive for each symbol (column 17, lines 1-46, Equation 16) a plurality of soft symbol values represented as symbol log likelihood ratios;

determine (column 17, lines 1-46, Equation 17, numerator), for each bit in the symbol, a first likelihood representing the probability that the bit is a one, the first likelihood determined based on the symbol log likelihood ratios;

determine (column 17, lines 1-46, Equation 17, denominator), for each bit in the symbol, a second likelihood representing the probability that the bit is a zero, the second likelihood determined based on the symbol log likelihood ratios;

compute (column 17, lines 1-46, Equation 17) a soft bit value for the bit as a function of the first likelihood and the second likelihood; and

a second decoder (Fig. 20B, slicer) adapted to receive the soft bit values and to generate binary received data therefrom.

Divsalar et al. does not disclose the decoders and converter are implemented into a communications receiver for receiving M-ary transmitted signals comprising:

an RF front end circuit for receiving and converting the M-ary transmitted signal to a baseband signal;

a demodulator adapted to receive the baseband signal and to generate a received signal therefrom in accordance with the M-ary modulation scheme used to generate the transmitted signal;

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the devices of Divsalar et al. into a communication receiver as described above to allow the receiver to recover the originally transmitted signal. The devices of Divsalar et al allow the recovery of the original source information without use of a received data signal corresponding to the original source information (see Abstract).

Regarding claims 55-57, which inherit the limitations of claim 54, Divsalar et al. does not disclose a speech decoder, switch data means, or packet switch data means to convert the output of the second decoder to a speech signal or data stream. However, it would have been obvious to

one of ordinary skill in the art that the output of the second decoder which provides a decoded output signal could have been processed in many different ways. It is well known in the art that speech decoders produce speech signals and switches can be used to convert a signal to a data stream. Thus, the further processing the signal from the output of the decoder does not constitute patentability.

Regarding claims 58 and 59, Divsalar et al. does not disclose the devices are adapted to receive and decode a GSM signal or a GERAN system signal. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made that since these signals are modulated and transmitted using encoded symbols comprised of bits that the devices are adapted to receive and decode these signals. Thus, the type of signal would not change the functionality of the devices and therefore, claims 58 and 59 do not constitute patentability.

Regarding claim 60, which inherits the limitations of claim 54, Divsalar et al. does not disclose the second decoder comprises a convolutional decoder based on the Viterbi Algorithm. However, it would have been obvious to one skilled in the art at the time the invention was made that a convolutional decoder based on the Viterbi Algorithm is one of many methods used to decode soft bit values to produce a decoded bit stream. Thus, using this type of decoder to produce a decoded bit stream is deemed a design choice and does not constitute patentability.

Regarding claim 61, which inherits the limitations of claim 54, Divsalar et al. does not disclose the received signal is an 8-PSK symbol. However, it would have been obvious to one of ordinary skill in the art that since Divsalar produces soft symbol values from received symbols (column 17, lines 1-46) that the received signal could have been an 8-PSK symbol. Thus, the

type of symbol would not change the functionality of the operation of Divsalar et al., and claim 61 does not constitute patentability.

Regarding claim 62, which inherits the limitations of claim 54, Divsalar et al. discloses the step of generating the soft decision value represented as a LLR (column 17, equation 16).

Regarding claim 63, which inherits the limitation of claim 63, Divsalar et al. does not disclose the first decoder comprises a MLSE equalizer based on the SOVA. However, it would have been obvious to one of ordinary skill in the art to equalize the signals input/output to and from the decoder to obtain more accurate decoding results. This would enhance performance of future processing of the signal.

Regarding claim 64, which inherits the limitation of claim 54, Divsalar et al. discloses the first decoder comprises means for performing a MAP algorithm (column 17, lines 1-46).

Regarding claim 65, which inherits the limitations of claim 54, Divsalar et al. discloses the soft bit values are computed from the soft symbol values whereby the most likely log likelihood value is compared with one other symbol log likelihood value corresponding to a bit value opposite to that of the bit of interest (column 17, Equation 17).

Regarding claim 67, which inherits the limitations of claim 54, Divsalar et al. discloses the step of outputting the soft bit values to a de-interleaver whose output is subsequently input to a soft second decoder for decoding into binary data therefrom (Fig. 20D2, column 32, lines 36-48, wherein the slicer is a soft second decoder).

Regarding claims 68-73, Divsalar et al. does not disclose the methods of claims 49-54 implemented into an electronic data storage medial storing a computer program adapted to program a computer to execute the soft output generator process or written as a computer



Art Unit: 2634

program (software) in a computer readable storage medium. A computer readable medium is an electronic, magnetic, optical, or other physical device or means that can contain or store a computer program for use by or in connection with a computer-related system or method. One skilled in the art at the time the invention was made would have clearly recognized that the method of Divsalar et al. would have been implemented into software. The implemented software would perform the same function of the hardware for less expense, greater adaptability, and greater flexibility. Therefore, it would have been obvious to have used the software in Divsalar et al. order to reduce cost and improve the adaptability and flexibility of the communication system.

*Allowable Subject Matter*

5. Claims 1-17 and 32-48 are allowable over prior art references (if objections are overcome) because related references do not disclose partitioning soft symbol decisions into bit groups, each group comprising a zero bit portion and a one-bit portion and determining soft bit values from those groups. Claims 18-31 are allowable over prior art (if above objections are overcome) because related references do not disclose receiving soft symbol values represented as symbol log likelihood ratios wherein the soft symbol values comprise a first soft symbol value corresponding to a most likely symbol and second soft symbol values wherein each second soft symbol value corresponds to a symbol closest in Euclidean distance to said most likely symbol whose bit in the position is opposite that of the analogous bit in said most likely symbol; and calculating a soft bit value based of the first and second soft symbol values.

6. Claims 66 and 74 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jeong (US 2002/0067777) and Geralch et al. (U. S. Patent No. 6, 499, 128) disclose methods of converting soft symbols into soft bits which involve likelihood ratios.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Curtis B. Odom whose telephone number is 571-272-3046. The examiner can normally be reached on Monday- Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 571-272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 09/754,570

Page 10

Art Unit: 2634

Curtis Odom  
January 5, 2005



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